## Space Weather Forecast

Issued on Thursday, 16 November 2023 at 13:07 Local

**This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales**

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### Space Weather Forecast Headline: Possible Earth-bound CME due in new UTC working week.

### Analysis of Space Weather Activity over past 24 hours

**Solar Activity:** Solar activity has remained low over the past 24 hours, with a relatively subdued X-ray trace peaking with an isolated upper-end Common-class flare at 15/1212UTC from an off-going sunspot region in the southwest. There are now up to three sunspot regions on the facing side of the Sun. Nominally the most complex of the regions is one occupying the southwest, however this has undergone some consolidation in the past 12 hours or so. By contrast, a second spot group in the vicinity has shown some proliferation of spots, but all while remaining small and relatively magnetically simple.

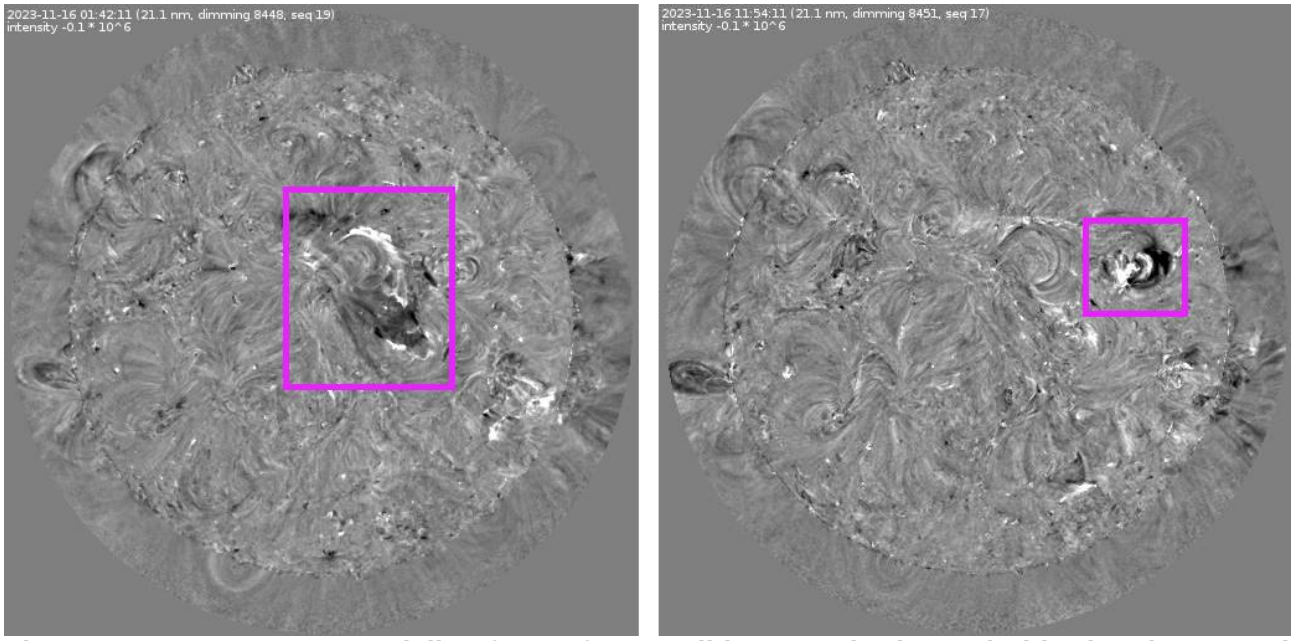


**Figure 1: Two events potentially of note for possible CMEs in the period in time-integrated extreme UV (processing courtesy of SIDC ROB). Firstly the 16/0100UTC filament eruption (left) and secondly a coronal dimming in the northwest around 16/1130UTC (right).**

There were a number of Coronal Mass Ejections (CMEs) visible on satellite imagery in the past 24 hours, and unpicking them has been a major task of the current UTC morning. Of all these events, potentially most relevantly a 'filament' channel-like signature (footprint from an arc of plasma departing the Sun) was seen in the northwest from near N20W020 on extreme UV imagery after 16/0100UTC. This event unfortunately coincided with a gap in in ground-based observatory near-infrared coverage, however the lead-up was captured as an emerging and darkening filament by Udaipur, India - a footprint that has since vanished. This feature has been analysed and carries a

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chance of affecting Earth around the turn of the UTC day Monday 20 into Tuesday 21 November, although with significant error bars of around +/-12 proffered by MOSWOC modelling. A second candidate for a CME of note was then observed as a 'coronal dimming' in the northwest at 16/1130UTC. Imagery for this event is awaited.

The other CME events of the period were: firstly, a far-sided high latitude event in the northeast around 15/1300UTC; secondly, a slower 'prominence' (arc of plasma on the visible edge of the Sun) leaving the southwest around 15/1500UTC; and thirdly, a low latitude far-sided CME starting 16/0400UTC. None of these are currently thought likely to affect the forecast.

**Solar Wind / Geomagnetic Activity:** Solar winds were initially at background, but showed a slight overall rising trend into slightly elevated levels as the period progressed. There was no clear 'seam' between any slow and fast regimes, however there is a faint possibility that a hesitant connection to a 'coronal hole' is establishing, although this is far from conclusive attribution. Both the number of particles in the solar wind and their associated magnetic field were within their typical range throughout these changes. The net result of the above solar wind measures was for provisionally mainly quiet geomagnetic activity.

**Energetic Particles / Solar Radiation:** No solar radiation storms were observed.

## Four-Day Space Weather Forecast Summary

**Solar Activity:** Solar activity is expected to remain low, but with a daily slight chance of rising to moderate, more so later in the four-day period given the prospect of eastern solar horizon sunspot arrivals.

**Solar Wind / Geomagnetic Activity:** The 16/0100UTC possible filament-related CME may affect Earth beyond the scope of this forecast period, i.e. around the turn of the UTC day Monday 20 into Tuesday 21 November, with +/-12 hour error bars. A second possible CME candidate from 16/1130UTC is awaiting imagery. No other CMEs were noted.

The coronal hole based forecast is relatively low confidence but low impact, with a weak enhancement from a 'coronal hole' possible on day 1 (Thursday 16 November), easing by the coming UTC weekend.

Activity should peak below Minor Geomagnetic Storm G1 in the first 24 hours, else revert to quiet. There is perhaps a slight chance of G1 into the new working week as a result of the 16/0100UTC CME, with further analyses likely to distil this forecast further.

**Energetic Particles / Solar Radiation:** No solar radiation storms are expected.

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**Geomagnetic Storms:**

| Geo-Magnetic Storm Probability (Exceedance) | Level | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) (%) | Day 2 (00-24 UTC) (%) | Day 3 (00-24 UTC) (%) | Day 4 (00-24 UTC) (%) |
|---|---|---|---|---|---|---|
| Minor or Moderate | G1 to G2 | No | 5 | 1 | 1 | 1 |
| Strong | G3 | No | 1 | 1 | 1 | 1 |
| Severe | G4 | No | 1 | 1 | 1 | 1 |
| Extreme | G5 | No | 1 | 1 | 1 | 1 |

**Radio Blackouts - X Ray Flares:**

| X Ray Flares Probability | Level | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) (%) | Day 2 (00-24 UTC) (%) | Day 3 (00-24 UTC) (%) | Day 4 (00-24 UTC) (%) |
|---|---|---|---|---|---|---|
| Active | R1-R2 M Class | No | 10 | 10 | 15 | 20 |
| Very Active | R3 to R5 X | No | 1 | 1 | 1 | 1 |

**Solar Radiation Storms - (High Energy Protons):**

| Radiation Storms Probability (Exceedance) | Level ($cm^{-2}$ $sr^{-1}$ $s^{-1}$) | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) (%) | Day 2 (00-24 UTC) (%) | Day 3 (00-24 UTC) (%) | Day 4 (00-24 UTC) (%) |
|---|---|---|---|---|---|---|
| Active | ≥ S1 | No | 1 | 1 | 1 | 1 |
| Very Active | ≥ S3 * | No | 1 | 1 | 1 | 1 |

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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